

WHAT IS CLAIMED IS:

1. A method for gravure coating a solution reactive to atmosphere conditions, comprising the steps of:

- (a) providing a moving web to be coated by a gravure cylinder;
- (b) forming a jet or curtain of coating solution to impinge on and wet an engraved surface of the gravure cylinder;
- (c) forming one or more zones by enveloping the gravure cylinder and jet or curtain of coating solution; and
- (d) distributing inert gas within one or more zones without disrupting the jet or curtain of coating solution during wetting of the surface of the gravure cylinder.

2. The method claimed in claim 1, wherein the step of forming the jet or curtain of coating solution includes metering the coating solution and distributing the coating solution via a die having at least one distribution cavity and at least one slit.

3. The method claimed in claim 1, wherein the step of distributing the inert gas includes metering the inert gas and distributing the inert gas via a conduit with holes.

4. The method claimed in claim 1, wherein the step of distributing the inert gas includes metering the inert gas and distributing the inert gas via a conduit with one or more walls comprising a series of screens or perforated/porous plates.

5. The method claimed in claim 1, wherein the inert gas is nitrogen.
6. The method claimed in claim 1, wherein the step of distributing the inert gas includes controlling the inert gas' flow rate within the one or more zones.
7. The method claimed in claim 1, wherein the step of forming the curtain of coating solution employs a slide die or a weir.
8. The method claimed in claim 1, wherein the step of forming one or more zones for receiving the inert gas includes dividing spaces in relation to the gravure cylinder and providing a shroud for enclosing the gravure cylinder into the one or more zones.
9. The method claimed in claim 1, wherein there are three zones.
10. The method claimed in claim 1, wherein the step of distributing the inert gas within the plurality of zones without disrupting the jet or curtain of coating solution includes displacing atmospheric water vapor.
11. The method claimed in claim 8, wherein the gravure cylinder and shroud are enclosed within solid doors and/or walls.
12. The method claimed in claim 1, wherein the step of forming the jet of coating solution employs a die.

13. A gravure coating apparatus, comprising:

- a) a gravure cylinder having an engraved surface;
- b) a means for causing a web to come into contact with the gravure cylinder in order to form a nip;
- c) a doctor blade, positioned prior to the nip, for wiping off excess coating liquid from the engraved surface of the gravure cylinder;
- d) a jet or curtain formation means to form a jet or curtain of the coating solution such that the coating solution impinges on and wets the engraved surface of the gravure cylinder;
- e) a shroud that encloses the gravure cylinder and the jet or curtain formation means while providing a gap between the shroud and the web, and includes at least one drainage port;
- f) one or more zones in an enclosed region for receiving an inert gas, wherein the jet or curtain stably operates within at least one zone having the inert gas; and
- g) a gas supply for distributing the inert gas within the one or more zones.

14. The gravure coating apparatus claimed in claim 13, wherein the one or more zones are partitioned with one or more baffles.

15. The gravure coating apparatus claimed in claim 14, wherein a first zone exists between the nip and the baffle.

16. The gravure coating apparatus claimed in claim 14, wherein a second zone exists between the baffle and the doctor blade.

17. The gravure coating apparatus claimed in claim 14, wherein a third zone exists between the doctor blade and the nip.

18. The gravure coating apparatus claimed in claim 13, wherein each of the one or more zones is supplied with the inert gas.

19. The gravure coating apparatus claimed in claim 13, wherein the jet formation means is a die with at least one distribution cavity and at least one slit.

20. The gravure coating apparatus claimed in claim 19, wherein the slit has a height between 100 and 300 microns.

21. The gravure coating apparatus claimed in claim 13, wherein the curtain formation means is a weir or a slide die.

22. The gravure coating apparatus claimed in claim 13, wherein the gap is less than about 1 cm.

23. The gravure coating apparatus claimed in claim 13, wherein the gap between the shroud and the doctor blade means is less than 1 mm.

24. The gravure coating apparatus claimed in claim 13, further comprising:

h) a controller for controlling the inert gas' flow rate within the one or more zones.

25. The gravure coating apparatus claimed in claim 13, wherein the gas supply for distributing the inert gas is a conduit with holes.

26. The gravure coating apparatus claimed in claim 13, wherein the gas supply for distributing the inert gas is a conduit with one or more walls comprising screens or perforated plates in series.

27. The gravure coating apparatus claimed in claim 13, wherein the gas supply for distributing the inert gas is a conduit with one or more walls comprising porous plates in series.

28. The gravure coating apparatus claimed in claim 13, wherein the gas supply for distributing the inert gas is proximate the web.

29. The gravure coating apparatus claimed in claim 13, wherein the gas supply for distributing the inert gas is proximate said baffle.

30. The gravure coating apparatus claimed in claim 13, wherein the doctor blade includes a deflector.

31. The gravure coating apparatus claimed in claim 13, wherein the inert gas is nitrogen.

32. The gravure coating apparatus claimed in claim 13, further comprising solid doors and walls that, together with the web, enclose the gravure cylinder, the jet or curtain formation means, and the shroud.

33. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 1.

34. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 2.

35. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 3.

36. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 4.

37. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 5.

38. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 6.

39. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 7.

40. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 8.

41. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 9.

42. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 10.

43. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 11.

44. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 12.